exceptionally interesting native flora, and with this object he has, in addition to his various official reports, contributed from time to time popular botanical articles to different local journals. The material for several of these articles has been worked up into the more homogeneous ecological account now published by the Government of New Zealand for the benefit of private individuals and for instruction in schools.

The wealth of botanical treasures is truly great. Thus the forests comprise mixed forests—in which the ancient kauri pine, *Agathis australis* and *Beilschmiedia tarairi*, are conspicuous—and pure forests of *Podocarpus dacrydioides* and Nothofagus. The mixed forests are the homes of abundant lianes—to mention only species of Metrosideros, the liliaceous *Rhizopogon scandens* and *Lygodium reticulatum*—many tree ferns and epiphytes. No less interesting are the shrubs, chief amongst which are the subalpine species of Olearia, Cassinia, and Veronica, while the manuka, *Leptospermum scoparium*, and allied species play an important part in the physiognomy of the native heaths. Then again the alpine meadows are rich in floral gems, notably species of Euphrasia, Ourisia, Celmisia, and Ranunculus. Amongst plant curiosities the vegetable sheep, *Raoulia eximia*, is the most unique.

In addition to the ecology, chapters are devoted to an account of the early explorers, naturalised plants, the stories of four common plants—New Zealand flax, manuka, Fuchsia, and *Cordyline australis*—and plant cultivation. The few examples noted above will serve to indicate how rich and unique is the New Zealand flora; Dr. Cockayne's treatment is fully equal to his subject, and one could only wish that he had much more space to enter into greater detail. The numerous illustrations, although imperfectly reproduced, contribute a better realisation of the plant scenery.

De la Méthode dans les Sciences. Deuxième Série. by B. Baillaud, L. Bertrand, L. Blaringhem, E. Borel, G. Lanson, L. March, A. Meillet, J. Perrin, S. Reinach, and R. Zeiller. Pp. iii+365. (Paris: Félix Alcan, 1911.) Price 3.50 francs.

THE first series of studies in the methods of science by distinguished French writers was reviewed in NATURE on September 23, 1909 (vol. lxxxi., p. 361). The present volume has the same general characteristics, though the point of view is more technical and less philosophical. The following branches of science, which were not dealt with in the former volume, receive attention—astronomy, physical chemistry, geology, botany and palæobotany, archæology, literary history, linguistics, and statistics. The essays should assist in providing the reader with a broad general view of scientific methods, and help to correct the narrowness which may result from a too exclusive absorption in a restricted field of scientific investigation.

Essays in Historical Chemistry. By Sir Edward Thorpe, C.B., F.R.S. Third edition. Pp. xii+601. (London: Macmillan and Co., Ltd., 1911.) Price 12*s.* net.

PREVIOUS editions of this valuable work have been reviewed in these columns at some length, the first in our issue for April 12, 1894 (vol. xlix., p. 551), and the second in that of August 14, 1902 (vol lxvi., p. 365). The present edition differs from the last in including the memorial lecture on Julius Thomsen delivered to the Fellows of the Chemical Society on February 17, 1910. We also notice an addendum to the life of Prof. Stanislao Cannizzaro, who died at Rome on May 10, 1910.

School Planning at Home and Abroad. By William H. Webb. Pp. 42. (London: The Sanitary Publishing Co., Ltd., 1911.) Price 1*s.* net.

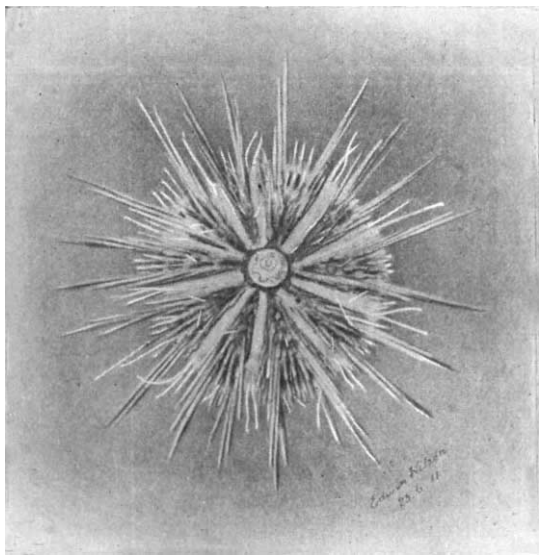
AT the annual congress of the Royal Sanitary Institute, held in September last at Brighton, Mr. Webb read a paper on "Large Public Elementary Schools in Town Districts." The paper is here published in book form, and illustrated by plans and other diagrams. Mr. Webb's inquiries respecting the characteristics of school buildings in various parts of Europe and America enable him to provide those responsible for the design of new schools with many useful hints.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Rearing of Sea Urchins.

I ENCLOSE a photograph which may interest your readers. It is one of a water-colour painting of a sea-urchin, magnified 4 diameters, which has been reared in my laboratory by Dr. Cresswell Shearer. It is a hybrid, a cross between *Echinus milearis* (male) and *E. esculentus* (female), both obtained from the Plymouth Marine Laboratory. The cross was effected in the early part of March last. It was kept in thoroughly aërated seawater for



some time, but has for the last three months been living in a bell-jar with part of an old crock covered by worm tubes, without the water being aërated in any way. It generally shelters in the day time under the crock. When disturbed, it moves actively away from the light, and still appears thoroughly healthy. It shows what may be done in an inland laboratory with simple appliances.

J. STANLEY GARDINER.

Zoological Laboratory, Cambridge, July 10.

Absorption Markings in "K" Spectroheliograms.

MR. EVERSHED'S remarks in NATURE of May 11 cause me to think that possibly an essential difference in the method employed for reproducing original negatives for journalistic purposes might go far towards explaining the difference of definition and richness of detail in M. Deslandres' plates. Anyhow, we are now assured that the Kodaikánal negatives show in the main the same structures as those taken at Meudon. Yet if the former admittedly permit such a great amount of K_2 radiation to

mingle with K_3, it seems to me risky to base certain reasonings on the appearance of the resulting spectroheliograms. Accepting Prof. Hale's interpretation, given now many years ago, that K_3 represents the highest level and K_2 an intermediate one, I submit that the Meudon plates are more likely to represent the true spectroheliographic aspect of the sun. It may be, as Mr. Evershed says, that the dark concentrations called flocculi are entirely due to variations in the intensity of the narrow absorption line (or, in my opinion, rather the other way about); but is not this variation due, if not entirely, at least to a great extent, to the presence or absence or degree of intensity of the K_2 radiations on either side of K_3? A study of M. Deslandres' spectroheliograms taken on the sectional principle leads one irresistibly to think so. From the preceding remarks anyone can gather why I considered, and still do, the assumption of alternating appearance and disappearance of the large flocculus covering the range of prominences during March and April, 1910, rather unlikely.

As regards the points raised by me about absorptively acting clouds seemingly cutting off the range of prominences sharply at one common level, I must adhere to my statements. They are the result of *repeated* direct observation, and the phenomenon was strikingly on view again only as recently as April 26, when a fine range of prominences on the north-east limb showed it fairly well. I have given in *The Observatory* recently a summary of my observational experiences up to date, and amongst other matters also refer to the often seen phenomenon of dark matter being interposed between solar prominences and the observer at levels attained by the luminous portions of the prominences themselves. Such observations have by no means remained unique, and I possess, through the kindness of Mr. Slocum, a pair of excellent photographs depicting it in a case of some fine prominences seen during October, 1910. As regards my several visual observations of apparently overlying flat and dark clouds (*darker* than the general dark tint of the surrounding sky) abruptly stopping the bright upwards flowing prominence vapours, I feel certain that if Mr. Evershed had been at my side at the time his practised eye would not have failed him to see what I saw, but whether he would have been able to record it on a photographic plate in monochromatic light (Hα) without an eclipse I hesitate to say. I hope, however, that the hypothetical overlying cloud will not be taken as of the nature of "smoke" over a fire. In my opinion it is more a case of the rather abrupt entry of rising hot vapours into a well-defined, more or less horizontal, stratum of considerably less temperature, and that at a comparatively abnormally low solar level. I readily admit that the cases are few where the circumstances necessary for the phenomenon favourably combine with the all too rare cases of the equally necessary perfect definition.

ALBERT ALFRED BUSS.

"Barrowdale," 22 Egerton Road, Chorlton-cum-Hardy, Manchester, May 13.

IF it is true, as Mr. Buss suggests, that variations in the intensity of the components of the emission line K_2 on either side of the absorption line K_3 are sufficient to account for the dark markings occasionally found in spectroheliograms, then the Kodaikánal plates should show them as conspicuously as those taken with a high dispersion instrument, which isolates the central line. Yet this, as Mr. Buss has himself pointed out, is not the case. In studying high dispersion spectrum photographs of the solar disc, one occasionally discovers places where the K_3 line is abnormally dark, and the same thing may also be well observed in the line Hα. When the spectroscope slit chances to cross one of these linear markings, an intensely black spot is seen on the absorption line, and this will usually remain visible or run along the line if the solar image is moved slightly. In the case of the lines H and K, the components of the emission lines H_2 and K_2 are, I think, always weak at the points of greatest darkness in the absorption lines, and for this reason they may possibly contribute somewhat to the final result in our plates.

The intermittent character of the absorption marking described by me in *The Astrophysical Journal* for January is, I think, demonstrable from a careful study of our spectroheliogram negatives, notwithstanding the fact that these plates are of a somewhat composite character, representing the sun in K_2 and K_3 radiations. The disappearance of the enormously extended marking between March 25 and 26, 1910, could be accounted for, it is true, on the supposition that in the interval between these days there was a development of velocity in the line of sight exceeding 15 kilometres per second; this would alter the wavelength sufficiently to throw the dark K_3 line entirely off the camera-slit. But such motion in a prominence usually, if not always, presages a complete dissolution.

Instances of the rapid disappearance of these curious absorption markings are not infrequently met with in Hα spectroheliograms, which show them so much more clearly than do the low dispersion calcium plates. Since completing the construction of the new auto-collimating spectroheliograph of this observatory, I have obtained a nearly continuous daily series of Hα plates during April and May of this year. These are taken with the camera-slit adjusted on the central portion of the line, and represent the highest levels on the sun. The images show most of the prominences as absorption markings on the disc, and some of them are so dark as to appear like clear glass in the negatives. Already in this short series several cases have been noted of the disappearance within twenty-four hours of very large masses of absorbing material.

An interesting example was photographed on May 27 at 2h. 28m. and 2h. 53m. a.m. G.C.T. The disc of the sun in these plates appears to have had a large letter S engraved upon it with great distinctness. If drawn out into a straight line, the S would measure more than 150,000 miles in length. On the following morning we examined the plates with great curiosity to see what the next letter might be! The main portion of the marking had, however, entirely disappeared, and only a few small patches remained. This marking came into being with equal suddenness, for an excellent plate taken on May 26 shows no trace of it.

While agreeing with Mr. Buss as to the occasional presence of small patches of absorbing matter interposed between a prominence at the limb and the observer, I am sorry that both our visual and photographic records are entirely at variance with him with regard to the supposed absorbing clouds overlying certain prominences, which appeared to Mr. Buss to be cut off at one common level. I have before me the K-line negatives and the drawings in Hα of the prominences of March 17 and 18, 1910, and April 26 and 27, 1911, both of which Mr. Buss has cited as instances. These prominences were observed here and photographed under almost as good conditions as can be had at 7700 feet altitude, and the photographs show a mass of detail in the higher parts, especially in the prominence of 1910. Yet there is no trace of any such appearance as Mr. Buss has described; the highest filaments rise to many different altitudes, both on the drawings and photographs.

I may perhaps mention that reproductions of our photographs of the 1910 prominence, as well as some of the solar disc showing the absorption markings, have been sent as an exhibit to the Indian Section of the Festival of Empire.

J. EVERSHED.

Kodaikánal Observatory, June 12.

Hamilton and Tait.

THOUGH I did not miss the passage in his Life of Tait to which Dr. Knott refers in NATURE of July 20 (p. 77), I forgot about it when I wrote my review. The point as to Hamilton's activity in quaternionic work is not of very great importance, but my statement is borne out by Graves's Life of Hamilton, which I read long ago, and have again referred to, as well as by the published correspondence. Tait's introduction to Hamilton took place in 1858; Graves states (vol. iii., p. 97) that Hamilton allowed himself to be diverted *in 1857* from quaternions—the task, he says, of writing the "Elements"—by the subject of definite integrals. According to Dr. Knott, Hamilton did not begin the composition of the "Elements" until a good deal later, and this view would appear from Dr. Knott's statement, and from Hamilton's own language in his letters, to be correct.

A. G.